The printing trades

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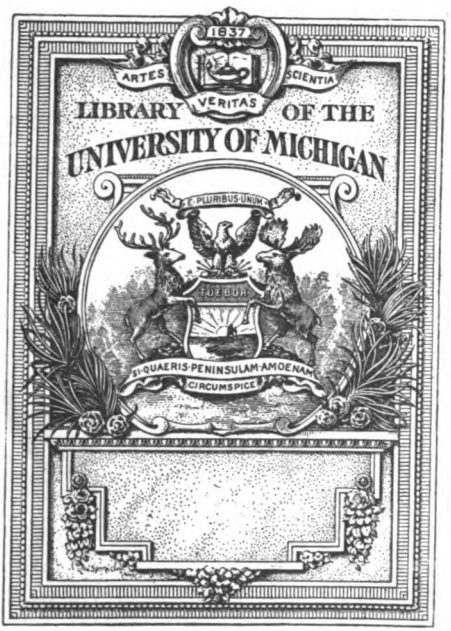

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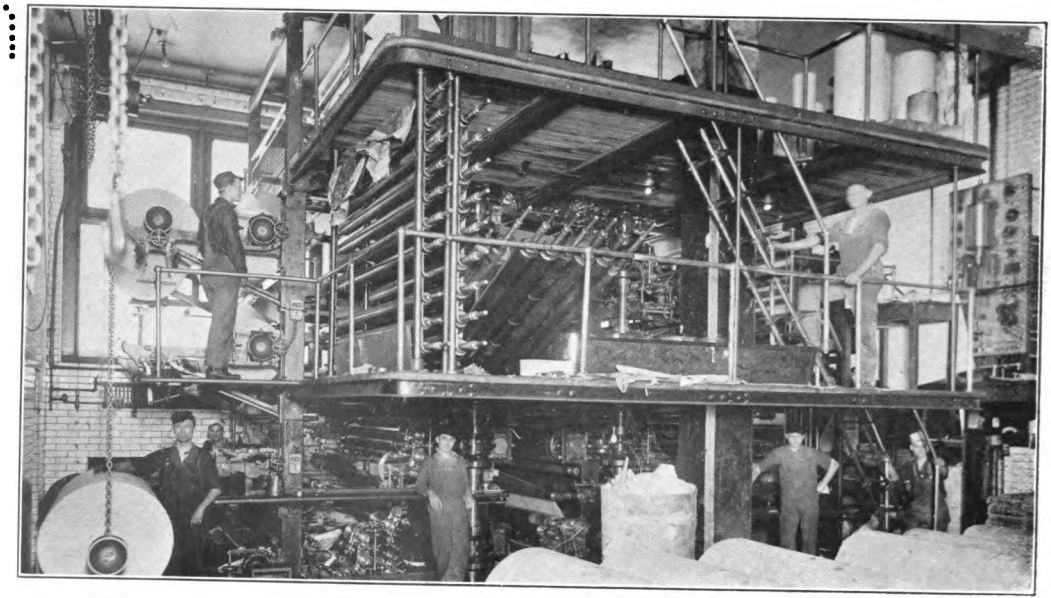

A giant web press used by a local newspaper

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CLEVELAND EDUCATION SURVEY

THE PRINTING TRADES

BY

FRANK L. SHAW

THE SURVEY COMMITTEE OF THE
CLEVELAND FOUNDATION
CLEVELAND · OHIO

16 1916

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FOREWORD

This report on "The Printing Trades" is one of the 25 sections of the report of the Education Survey of Cleveland conducted by the Survey Committee of the Cleveland Foundation in 1915. Twenty-three of these sections will be published as separate monographs. In addition there will be a larger volume giving a summary of the findings and recommendations relating to the regular work of the public schools, and a second similar volume giving the summary of those sections relating to industrial education. Copies of all these publications may be obtained from the Cleveland Foundation. They may also be obtained from the Division of Education of the Russell Sage Foundation, New York City. A complete list will be found in the back of this volume, together with prices.

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THE PRINTING TRADES

CHAPTER I

THE PRINTING INDUSTRY

Few stories of industrial history are more interesting than that of the rise and development of the art of printing. A thousand years ago the Chinese did printing by engraving letters on blocks of wood, coating the surface with ink, placing a sheet of paper on this inked surface and then rubbing or tapping it until a satisfactory impression was secured. For nearly 500 years little improvement was made over this method. Then, about 1450, Gutenberg invented the first printing press and the first movable type. The press was made of wood and the type cast from lead. The printing itself was a slow and simple process. There was a bed or table which held the type. After these type were set and inked by hand, a piece of paper was carefully placed in position on them and the movable bed was pushed back under a flat block of wood which was then forced down by means of a ponderous wooden screw. This pressed the paper against

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the type which did the actual printing. The product of the press was about 50 sheets an hour.

During the 350 years which elapsed from the days of Gutenberg to the year 1800, only minor improvements were made in the mechanical side of printing. In the early years of the 19th century the cylinder press was perfected. This was a revolutionary development. Instead of the paper being pressed against the type by means of a block forced downward by a screw or lever it was now placed on the face of a revolving cylinder and rolled against the type. By this method printing was done much more rapidly than had previously been possible and the new invention rapidly displaced the old-style presses. It is interesting to note that while we still speak of the printing press, the fact is that it would be more accurate if we were to speak of many of the present-day printing machines as printing rollers instead of printing presses.

During the past half century the developments in the art of printing have succeeded one another with such rapidity that the whole industry has been revolutionized. The cylinder press, in which the paper was applied to the face of a revolving cylinder, was soon followed by the rotary press which consists in principle of two large revolving cylinders, one carrying the paper and the other carrying the plates that do the

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actual printing. Much modern printing where speed is required is done with presses of this sort. These machines have been improved until they are marvels of mechanical perfection. By their use newspapers and magazines are now printed in several colors, folded, and pasted at a speed as high as 75,000 an hour by one machine.

The developments of the last half century have been not confined to the printing presses. During that period zinc etching has made possible the cheap and rapid printing of illustrations and the half-tone process has been invented for making fine reproductions of photographs. Moreover, in the past 30 years typesetting machines have been perfected. These various developments are merely some of the most important ones that have remade the printing industry in the past half century. In that time almost every process of making type, setting type, printing, and making illustrations has gone through a series of successive improvements each one of which has been so important as to render the earlier method obsolete.

Size of the Industry

In the United States there were, in 1909, about 35,000 printing establishments, employing in all more than 400,000 people. On the basis of total

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value of product, printing ranked sixth among the manufacturing industries of the country with a total output in 1909 of $737,000,000.

A smaller proportion of the industrial population of Cleveland is engaged in printing than in most large cities. The number of persons employed in printing occupations in 1915 is estimated at approximately 3,900, made up chiefly of skilled workmen. Little common labor is employed in any department of the industry. The annual output—more than $10,000,000 is exceeded by only six manufacturing industries, and only four employ a greater number of wage-earners.

Many Small Establishments

The printing industry is essentially a business of small establishments. In 1909 there were 1,665 separate printing establishments in Ohio, of which approximately 20 per cent were "one-man" shops, employing no wage-earners, about 50 per cent employed from one to five wage-earners each, and less than 10 per cent had an average working force of more than 20 wage-earners.

The average manufacturing unit is smaller than in other leading factory industries. There are not more than 10 printing plants in the city

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which employ over 75 wage-earners. Data collected by the Survey Staff from 44 local printing shops showed an average working force of only 36 persons. The Census of Manufactures for 1909 gives an average of 13 wage-earners per establishment for the entire industry in Cleveland.

Due largely to these conditions, printing affords an unusual number of opportunities for advancement to the skilled workers in the industry. The smaller the establishments are, the greater is the proportion of proprietors, superintendents, managers, and foremen to the total number of wage-earners. Ten per cent of the total working force in the printing industry is employed in supervisory and directive positions. In many of the large industries of the city the proportion in such work is less than three per cent.

Mostly Native Workers

No other manufacturing industry in the city employs so large a proportion of American-born workers. In recent years many of the skilled industrial trades have been recruited, to a very large extent, from foreign labor, but so far the American worker has held his own remarkably well in the printing industry. This is due partly to the maintenance of relatively high wages and

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desirable working conditions, and partly to the necessity, in all branches of printing, for a working knowledge of English.

Union Organization

Practically all of the trades are thoroughly organized. There is a compositors' union, a pressmen's union, a pressfeeders' union, an electrotypers' union, a photo-engravers' union, a poster artists' union, and so on, through all the trades. The unions are united in a body called the Council of the Allied Printing Trades. Although only about half of the shops in the city employ union labor exclusively, union regulations as to wages and hours are observed in both open and closed shops. The strength of union organization throughout the trades is largely responsible for the high wages, short hours, and good working conditions which prevail in the industry.

Earnings

Printing workers are among the best paid industrial wage-earners in the city. The hourly wage scale in many building occupations is higher than in the skilled printing trades, but the building worker loses more time through unemployment and therefore probably earns less per year

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on the average than the printer. A comparison of weekly earnings in the various manufacturing industries of the city is shown in Diagram 1. This comparison is based upon the 1914 report

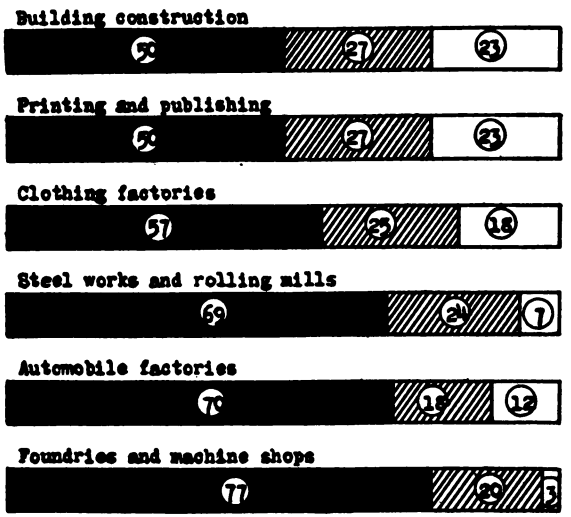

Diagram 1.—Number of men in each 100 in printing and five other industries earning each class of weekly wage. Black indicates less than $18, hatching, $18 to $25, and outline $25 and over

of the Ohio Industrial Commission. The data are for Cuyahoga County, but the returns for the city, if they could be separated, would show little variation from the figures given, since

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about nine-tenths of the population of the county reside in Cleveland.

The diagram shows in a striking way the relatively high position of the printing trades from

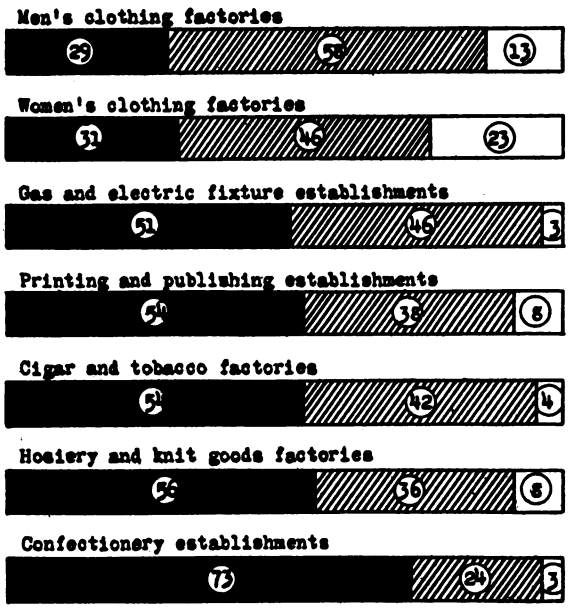

Diagram 2.—Number of women in each 100 in printing and six other industries earning each class of weekly wage. Black indicates less than $8, hatching $8 to $12, and outline $12 and over

the standpoint of financial reward. The percentage earning good wages is higher than in any of the other industries compared, except in building

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construction. Only about one-half as many employees in automobile factories earn $25.00 a week or over as in the printing industry, one-third as many in steel works and rolling mills, and about one-eighth as many in foundries and machine shops.

The comparison made in Diagram 2 of the earnings of women in various industries is less favorable to printing. On the basis of the proportion of women that earn $12.00 and over per week, this industry takes third place. It should be noted, however, that nearly all the women employed are engaged in semi-skilled work in binderies—a lower grade of work than that done by most women workers in clothing factories, where wages are higher. Compared with other occupations that require about the same amount of experience and training, in textile, tobacco, and confectionery manufacturing establishments the wages of women employed in printing are relatively high.

Regularity of Employment

Wage-earners in printing establishments lose less time through irregularity of employment than do those in most factory industries. Of the six leading manufacturing industries in the city, printing shows the least fluctuation in the

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size of the working force. The kind of work done by women is more seasonal than that done by men, although less so than in other manufacturing industries which employ large numbers of women. Diagram 3 shows the fluctuation during 1914 in the size of the working forces

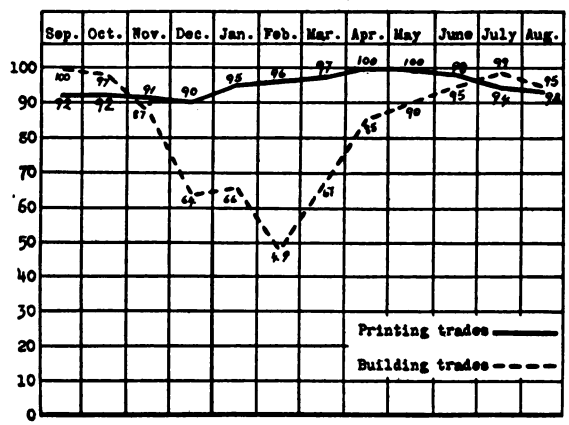

Diagram 3.—Percentage of men in the building trades and in the printing trades employed each month during the year. The largest number in any one month is taken as the base and is represented by 100 per cent

in the printing industry and the building industry. In each case the number in each industry during the months of greatest employment is represented by 100 per cent. It is noteworthy that in the case of printing the minimum number employed in any month never falls below

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90 per cent of the maximum number. In the building trades, on the other hand the fluctuations of employment are so serious that the minimum number falls to less than half of the maximum number.

Subdivisions of the Industry

There have been great changes since the days of Benjamin Franklin when the printer set the type, read the proof, ran the press, and bound the printed sheets into the finished volume. With the growth in the size of printing establishments and the introduction of modern machinery, the different processes have been divided and subdivided until today the printed book or magazine represents the work of more than 50 skilled trades, grouped in seven subdivisions of the industry. The distribution of the workers in these seven departments, with the estimated number in the city employed in each department, is shown in Table 1.

Very rarely are all these departments found in a single establishment. The average job-printing shop is made up of a composing-room, a pressroom, and a bindery. The large newspaper plant consists of a composing-room, a pressroom, and electrotyping, stereotyping, and photo-engraving departments. Some plants

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specialize in bindery work, others in the manufacture of printing plates. As a rule each firm tries to excel in a particular line of work in order to secure the monopoly value of a "specialty."

TABLE 1.—ESTIMATED NUMBER OF WAGE-EARNERS EMPLOYED IN EACH DEPARTMENT OF THE PRINTING INDUSTRY, CLEVELAND, 1915

Department	Men	Women	Total
Composing-room	1,150	53	1,203
Pressroom	1,068	98	1,166
Binding	390	462	852
Lithographing	410	..	410
Electrotyping	108	..	108
Photo-engraving	96	..	96
Stereotyping	40	..	40
Total	3,262	613	3,875

The workers do not commonly shift from one department of the industry to another, or from trade to trade. Men who learn their trade in job establishments sometimes change to newspaper work, or vice versa, but such shifts are now less frequent than they were formerly. Modern conditions tend constantly towards a sharper definition and limitation of work in each trade.

Summary

The art of printing was brought into being about a thousand years ago by the Chinese. The founder of the modern printing industry was

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Gutenberg who invented movable type and the first printing press about 1450. During the past half century almost every process of making type, setting type, printing, and making illustrations has gone through a series of successive improvements, each one of which has been so important as to render the earlier method obsolete.

Printing ranks among the six leading industries in Cleveland as well as in the United States as a whole. It is essentially a business of numerous small establishments. While there are about 4,000 people engaged in printing in Cleveland, there are not more than 10 establishments in the city employing over 75 wage-earners each.

Most of the people employed in the industry are skilled workmen. There is little common labor employed in any department. More than five-sixths of the employees are men and no other manufacturing industry employs so large a proportion of American-born workers. The industry is highly unionized.

There is more opportunity for advancement in printing than in most other industries because there is a greater proportion of proprietors, superintendents, managers, and foremen. Printers are among the best paid industrial wage-earners. Their hourly rates are high and the wage-earners lose less time through irregularity of

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employment than do those in most factory industries.

Printing is a highly specialized and subdivided industry. It is not a trade but a group of some 50 skilled trades divided among seven principal departments of the industry. The workers seldom shift from one department to another or from trade to trade.

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CHAPTER II

THE COMPOSING-ROOM

Until about 30 years ago, before practical typesetting machines were invented, all type was set by hand. Today, the hand-compositor, except in very small shops, works only on jobs requiring special type or special arrangement, such as advertisements, title pages of books, letter-heads, and so on.

Although the practice varies with different kinds of jobs and in different establishments, the compositor usually works from copy carefully prepared in the office, containing full instructions as to sizes and styles of type, spacing between lines, and other details. In many small shops, however, no detailed instructions accompany the copy, and the work consequently requires the exercise of careful judgment on the part of the compositor.

The hand-compositor must have good eyesight and the knack of handling type rapidly and surely, know thoroughly the type case, be able to use type measurements quickly and accurately, and know the various styles and sizes of

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type employed for different purposes. In addition, he should have a thorough knowledge of spelling, capitalization, punctuation, division of words, and some acquaintance with grammar. Language is the material he has to deal with in his trade and the more he knows about it the better.

The demand for artistic printing is steadily increasing, and the man who is looking for advancement beyond routine work will find a knowledge of page proportion and balance, decorative design, and color harmony of great value to him. The ability to do free-hand lettering is also an asset, as time can often be saved by sketching a job before setting it up.

Machine Operators

Typesetting for books, magazines, and newspapers is usually done on composing machines, either linotypes or monotypes. The linotype is the more commonly used in Cleveland. The machine is provided with a keyboard resembling that of a typewriter. As each key is struck by the operator it releases a matrix, or mold of a letter, which falls into a trough. When the line is complete, molten metal is forced against it. The metal cools quickly, forming a solid line of type.

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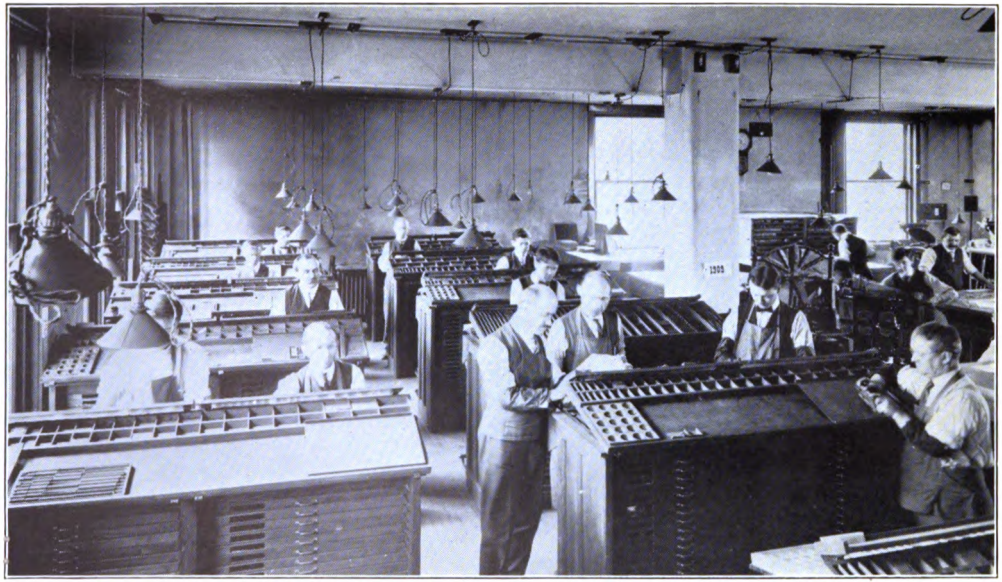

A corner of an up-to-date composing-room in a job shop

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The monotype consists of two machines, the "keyboard" and the "caster." The operation of the keyboard is similar to that of the linotype, but instead of releasing matrices it punches holes in a ribbon of paper at the top of the machine. This perforated paper, when placed in the caster, controls the action of the machine somewhat as a perforated roll controls a player piano. As the paper passes through the caster the type are cast, one at a time, in the order in which the letters and words were written on the keyboard.

The machine operator, like the hand-compositor, should have a thorough knowledge of spelling, punctuation, and the division of words. He needs a general knowledge of the principles of typography. Union regulations require a number of years' experience in hand-composition before machine operating may be taken up. Considerable practice is necessary to attain the high speed required. Nearly all work in newspaper plants is done at high pressure, and even in job establishments the machine operator must be able to work at a speed comparable to that maintained in fast typewriting.

In the smaller shops operators are in demand who know how to keep their own machines in good running order, and for this extra work re-

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ceive higher wages. In the larger shops linotype machinists do all repairing.

Proof-readers

The proof-reader compares the original copy with the proof, on which he notes any corrections to be made. He is assisted by the copy-holder—sometimes a woman—who reads copy to him. He must be unusually well versed in grammar, spelling, punctuation, capitalization, usage, and other essentials of a thorough knowledge of English, and understand the use of proof-reader's marks. A general knowledge of printing processes, while not absolutely essential, is undoubtedly of advantage.

Stonemen or Make-up Men

After the proof-reader's corrections have been made, the galleys of type go to the "stone," or imposing table. The stoneman transfers the type from the galley to a steel frame known as a chase. The type is then evened down with a mallet and planer, firmly fastened in place with blocks and wedges, and sent to the pressroom. Where the job to be printed contains a number of pages, the galleys of type are broken up, and the pages so arranged in the chase that when

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printed they will fold in consecutive order. The stoneman is usually an experienced compositor.

Number Employed

There are in Cleveland about 1,200 people in composing-room occupations, or about 30 per cent of the total number engaged in the printing industry. This number includes some 50 women employed as proof-readers and copy-holders.

In job-printing establishments the hand-compositors outnumber the machine operators more than four to one. Even in newspaper plants the excess of machine operators over hand-compositors is less than 10 per cent. For the whole city the ratio of hand workers to machine workers is more than two to one. Hand- and machine-compositors, with compositors' apprentices, constitute over 80 per cent of the total composing-room working force.

Union Organization

Nine-tenths of the composing-room workers in Cleveland are members of the International Typographical Union; although the number of shops that employ union men exclusively, called closed shops, approximates only one-half of the

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total number in the city. The remainder, while employing union labor, observing union hours, and paying union wages, reserve the right to hire non-union workers.

The Typographical Union is one of the oldest and most progressive labor unions in the country. Besides making provision for the training of apprentices, it has established a system of pensions for men grown old in the trade, and pays death benefits to the families of members. The union also maintains a sanitarium at Colorado Springs for aged and disabled members, and for those suffering from tuberculosis. In addition the union has an arbitration and conciliation agreement with the employers, demands equal pay for men and women, and provides for securing sanitary conditions in composing-rooms.

Wages

Composing-room workers are the best paid in the industry. A comparison of average wages received by the different groups of workers in newspaper and job establishments is shown in Table 2. The data on which this comparison is based were collected from 44 Cleveland printing establishments, employing in their composing-rooms a total of nearly 400 wage-earners.

The local union and the Cleveland Branch of

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the Printers League of America by mutual agreement recently adopted the following scale of wages for hand-compositors for five years, from January 1, 1916, to December 31, 1920: Day wages to be $20 for a week of 48 hours during the first year of the agreement, $21 in 1917, $22 in 1918 and 1919, and $23 in 1920. Wages for night work during the term of the agreement are to be $3 more than those for day work. This agreement applies only to job-printing establishments.

TABLE 2.—AVERAGE DAILY EARNINGS OF JOB AND NEWSPAPER COMPOSING-ROOM WORKERS, CLEVELAND, 1915

Workers in trade	Job offices	Newspaper offices
Foremen	$5.19	$6.65
Linotype machinists	4.66	4.84
Proof-readers	4.63	3.98
Monotype operators	4.57	..
Linotypers	4.28	4.65
Monotype casters	3.96	4.30
Stonemen	3.94	4.89
Hand-compositors	3.48	4.58
Copyholders	2.30	2.93
Apprentices	1.64	1.39

The rates for machine operating in job offices are governed by the established scale for newspaper offices, which was fixed by an agreement made in 1912. Under this agreement compensation for make-up men, bankmen, hand-compositors, proof-readers, typesetting-machine operators, machine tenders, and other journeymen

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in the composing-room is $25.80 a week for day work, and $28.80 for night work.

On the basis of hourly rates of wages, composition ranks among the highest paid of the manufacturing occupations. The union scale for machine operators is exceeded in most of the building trades, but the irregularity of employment in building work offsets the advantage in daily wages to some extent. Table 3 compares the hourly rates for compositors with the rates paid skilled workers in other factory industries.

TABLE 3.—UNION SCALE IN CENTS PER HOUR FOR COMPOSITORS AND FOR SKILLED WORKERS IN OTHER FACTORY INDUSTRIES

Workers in trade	Cents per hour
Composing-machine operators	**53.75**
Pattern makers	45.00
Horseshoers	44.44
Hand-compositors, book and job shops	**41.67**
Tool and die makers	40.00
Carriage and wagon makers	40.00
Molders	38.89
Coremakers	38.89
Metal polishers and buffers	36.11
Upholsterers	35.00
Boilermakers	35.00
All-round machinists	35.00
Machinists (specialists)	30.56

Health Conditions

Compositors suffer most from the diseases which are common to indoor workers. The stooping position in which much of the work is done, to-

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Stonemen preparing forms. Platen presses in the rear

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gether with insufficient ventilation and the presence of gases from the molten metal used in linotype and monotype machines, favors the development of lung diseases. The number of deaths from consumption among the compositors is more than double that in most outdoor occupations. There is some danger of lead poisoning, especially among linotype operators and monotype casters.

Apprenticeship

The apprenticeship system has held its own in the compositors' trade better than in most industrial occupations. In the establishments visited by the Survey Staff there were approximately 15 apprentices to each 100 hand- and machine-compositors. In most cases there is no real system or method of instruction. The points principally insisted upon by the union, which strongly favors the apprenticeship system, are that the number of apprentices employed shall not exceed that stipulated in the agreement between the employers and the union, and that each apprentice shall be required to serve the full term of five years.

The agreement between the union and the employers provides that there shall be but one apprentice to five journeymen in any one shop, with proportional increases of apprentices as the

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number of journeymen is increased. No shop may employ more than five apprentices. The minimum entrance age is fixed at 16 years, and the period of service at five years. Every apprentice must have at least a grammar school education. The committee charged with enforcing these regulations is given full power to require apprentices to be examined at the end of each year and to cancel indenture papers at any time if the apprentice does not show aptitude or proper qualifications for the work.

During the first and second years the apprentice is required to perform general work in the composing-room under the direction of the foreman. In the third year he joins the union as an apprentice. The agreement stipulates that during this year he must be employed four hours each day at composition and distribution. In the fourth and fifth years the number of hours per day on such work is increased to six and seven respectively. During the last two years of his term he must take the evening trade course given by the International Typographical Union, the expense of tuition being met by the local union. The agreement contains no stipulation as to wages for the first and second years. The wage for the third year is $9.00 a week, for the fourth year, $12.00, and for the fifth, $15.00.

Apprentices in newspaper composing-rooms

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are permitted to spend the last six months of their period working on typesetting machines. It is more difficult to learn machine composition in job establishments, as they have fewer machines and these are in constant use on regular work.

From the standpoint of the employer the desirable qualifications for admittance to the trade as an apprentice are well described in the 1913 report of the apprenticeship committee of the United Typothetæ and Franklin Clubs. They are as follows:

1. An earnest desire to become a printer
2. Good morals
3. At least a grammar school education
4. Mental alertness
5. Sober, industrious, thrifty parents
6. Good health—absence of physical deficiencies
7. Age approximately 15 years
8. Full average height
9. No cigarette smoking
10. Tidiness in appearance

Printing employers throughout the country have given considerable attention in the last few years to the matter of apprentice training. In 1913 the Committee on Apprentices of the United Typothetæ and Franklin Clubs of America made an extensive study of the subject,

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and one result of its recommendations was the appointment of a national apprentice director, under whose supervision a series of 62 handbooks, covering every phase of the printing industry, is being prepared for use in the training of apprentices.

Summary

Most typesetting is now done by machine instead of by hand, although hand work is still used on special jobs, such as advertisements, title pages, letter-heads, etc. There are two important typesetting machines—the linotype and the monotype. Each machine has a keyboard resembling that of the typewriter. Both machine operators and hand-compositors need a thorough knowledge of spelling, punctuation, capitalization, grammar, and the division of words. Other employees in the composing-room are the make-up men and proof-readers. Nearly one-third of the workers in the printing industry are employed in the composing-room.

The composing-room workers are the best paid in the printing industry. They are highly unionized and are required to serve an apprenticeship of five years. Apprentice training for composing-room work is better organized than in most of the manufacturing industries.

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CHAPTER III

THE PRESSROOM

The development of improved machines for presswork has kept pace with the rapid progress of the printing industry. A hundred years ago the printer did all his work by hand, using a clumsy press consisting of a heavy, upright frame supporting two flat surfaces so arranged that one could be screwed down against the other. After the printer had set the type and made up the form, he fastened it to the bed of the press, inked it, and laid on the sheet to be printed. He then covered the sheet with a blanket to soften the impression and screwed down the press. This entire process had to be repeated for each additional sheet. Today the hand press is used only for taking proofs. Complicated machines, driven by steam or electricity, have taken its place. They range in size from the card press of the stationery store to newspaper presses so large and heavy that they must be set up in rooms constructed especially for them.

Three kinds of presses are commonly used in

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commercial printing—platen, cylinder, and rotary. The platen press is the smallest and most easily operated. Like the old hand press, it prints from two flat surfaces. It is used chiefly for small printing, such as cards, letter-heads, and business forms.

Nearly all printing requiring the use of large sheets is done on cylinder presses. The type forms are placed on a flat bed which moves back and forth under a revolving cylinder on which the paper is fed. Cylinder presses are used almost exclusively in book and magazine printing.

The rotary press differs from the cylinder and platen presses in that it carries the type form on a cylinder instead of on a flat bed. The paper is printed as it passes between two cylinders, one carrying the paper and the other the type form.

The newspaper press represents an extension of the rotary principle. Every large newspaper press is a combination of several rotary presses. Each of these smaller units contains two form cylinders to which the curved stereotyped forms are secured, and opposite them two impression cylinders. The paper, which is fed to each unit from a separate roll, passes between the two pairs of form and impression cylinders and comes out printed on both sides. Cutting and folding

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machines form integral parts of the press, so that the process is continuous from the roll of white paper to the finished newspaper.

The press not only prints, folds, and cuts its product, but counts and stacks it, with every fiftieth or hundredth newspaper thrown diagonally across the pile. Some idea of the capacity of one of these machines may be gained from the statement that a large newspaper press, running at full speed, consumes between 50 and 75 miles of paper and turns out about 75,000 twelve-page papers an hour.

Cylinder and Platen Pressmen

Besides having the general care and supervision of his press, the platen or cylinder pressman has to adjust the form on the bed, "make ready" for printing; make "underlays" and "overlays," which are the trade names given to different methods for securing an even impression over the entire form; see that the printing "registers," that is, prints to the exact distance required from the margin of the paper; select the ink to be used on each job; regulate the ink supply; and so on. Color work, particularly, requires considerable knowledge of color combinations and of the working properties of different kinds of ink.

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Web Pressmen

The duties of the web or newspaper pressman differ materially from those of the ordinary cylinder pressman. He does only one kind of printing and it is the same the year round. His huge and complicated machine, made up of more than 50,000 separate parts, must be operated efficiently at high speed and with clock-like regularity. In case of a breakdown he has to know exactly what to do, and how to do it in the shortest possible time. He must possess a thorough knowledge of the mechanical principles involved in the operation of the press, and use the strictest care in its daily overhauling.

Newspaper pressmen are provided with three classes of assistants—brakemen, oilers, and flyboys. These assistants mount the forms upon the cylinders, introduce the paper, and attend to such other necessary details as making ready, oiling, and keeping the press clean.

Plate Printers

Plate printers operate a type of press used mainly to print such work as personal cards, wedding announcements, and invitations. This kind of printing is usually done on special presses, from steel or copper plates on which the lettering and designs have been engraved. It is limited to a few specialty shops.

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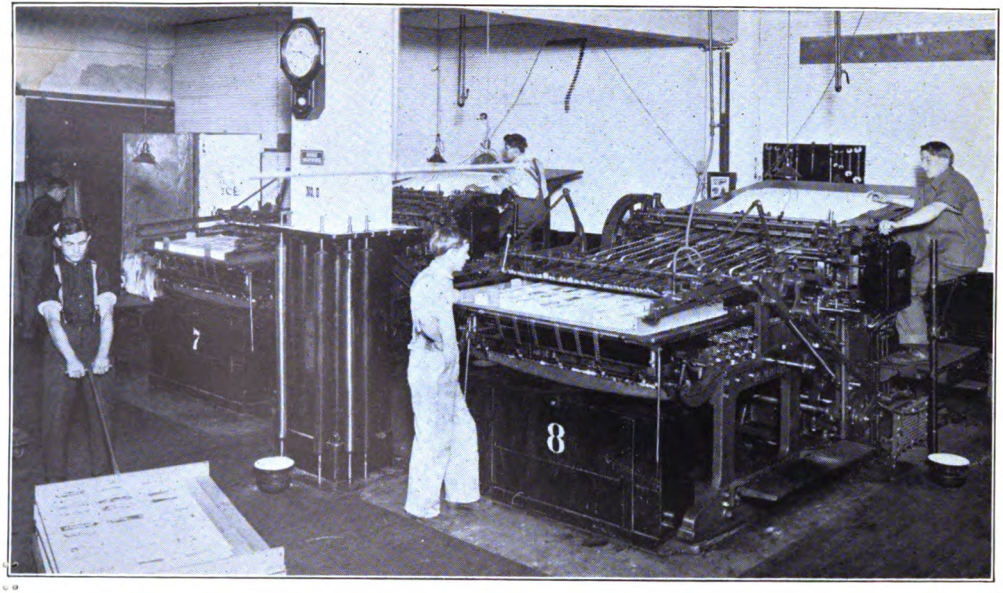

One type of cylinder press. One pressman often tends two presses

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Platen and Cylinder Pressfeeders

The platen pressfeeder feeds the paper and removes the printed sheets from the press. The cylinder pressfeeder has only to feed the paper, as the cylinder automatically carries the sheets through the press and piles them neatly after printing. The work requires little beyond skill in handling sheets of paper rapidly and can be learned in a few months.

In the large shops, where long runs are common, automatic mechanical pressfeeders are used extensively. It seems probable that they will eventually displace many of the hand workers now employed.

Other Occupations

Pressroom foremen are usually pressmen who operate a press in addition to directing the work of others. Only in the largest shops do the foremen devote all their time to supervision. Floormen are assistant pressmen. Beginners, called flyboys, are employed on odd jobs about the pressroom until they learn enough to take a hand at pressfeeding.

In the large shops there are usually one or two cutters who operate power-driven cutting machines for cutting and trimming the paper to the exact size required. The work calls for consider-

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able care and the ability to make simple arithmetical computations rapidly.

Number Employed

The pressroom is the second largest department in the industry, and gives employment in Cleveland to approximately 1,150 people. About 100 women are employed, chiefly in the large shops, as pressfeeders. Approximately 18 per cent of the men employed are cylinder pressmen, about 10 per cent platen pressmen, and less than three per cent web pressmen. Pressfeeders comprise over 40 per cent of the whole group. Nearly nine-tenths of all pressroom workers are employed in job establishments. Five occupations—those of cutters, floormen, flyboys, plate printers, and web pressmen—give employment to fewer than 40 men each.

Wages

Wages in this department are somewhat lower than in the composing-room. The average daily earnings of pressroom workers in the establishments from which wage data were collected during the survey are shown in Table 4.

The hourly rates of pay are high as compared with those in other occupations requiring an equal or greater amount of skill and knowledge. Cylinder pressmen earn more per hour than do

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TABLE 4.—AVERAGE DAILY EARNINGS OF PRESSROOM WORKERS

Job pressroom workers	
Foremen	$4.78
Cylinder pressmen	3.63
Cutters	3.41
Platen pressmen	2.97
Floormen	2.91
Cylinder pressfeeders, men	2.54
Cylinder pressfeeders, women	1.77
Platen pressfeeders, men	1.83
Platen pressfeeders, women	1.70
Flyboys	1.56
Newspaper pressroom workers	
Foremen	6.11
Web pressmen	4.33
Web pressmen's assistants	2.95

tool and die makers,—workers in one of the most highly skilled of the metal trades,—and platen pressmen in charge of five or more presses earn more than all-round machinists and boilermakers. The rate for cylinder pressfeeders is about three cents an hour higher than that received by the "specialist" machinist in the metal trades. The union scale per hour for various pressroom occupations is given in Table 5.

TABLE 5.—UNION SCALE IN CENTS PER HOUR IN VARIOUS PRESSROOM OCCUPATIONS

Pressmen	
Cylinder	41.67
Platen (five presses or over)	35.42
Platen (one or two presses)	27.08
Pressfeeders	
Cylinder	33.25
Platen	23.96
Assistants to pressmen	
Cylinder	34.37
Platen	28.13

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Health Conditions and Accident Risks

The chief danger to health in pressroom work is lack of ventilation, since to get the best results in printing, a warm, even temperature must be maintained. There is always some danger of accident in working about power-driven machinery. The risk in pressroom work is no greater than is usually found where machinery is used.

Learning the Trade

Formal apprenticeship is practically unknown in this department. The boy begins as a pressfeeder, usually on a platen press, and in the course of time gets to be a platen pressman. A knowledge of platen presswork does not qualify a man to run a cylinder press, and as a rule the platen pressman who wants to change must serve some time as cylinder pressfeeder and cylinder pressman's assistant.

In cylinder presswork there is no fixed line of promotion. A boy usually begins as a flyboy, and after learning pressfeeding may work up to the position of floorman, in which capacity, according to union regulations, he must serve four years before promotion to pressman. He may serve much longer, as he cannot be advanced until a vacancy occurs.

There is no organized system for training be-

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View of cutting machines. Separate cutting rooms are found only in large establishments

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ginners. The boy must pick up the trade through experience and practice. The length of time required to reach the position of pressman will depend largely on how frequently changes occur among the force of pressmen employed in the shop.

Summary

Three kinds of presses, known as the platen, the cylinder, and the rotary, are commonly used in commercial printing. The platen press has two flat surfaces, one holding the type and the other the paper and it prints by pressing these together. The cylinder press has one flat surface holding the type and a rotating cylinder which carries the paper and rolls it against the type. The rotary press has two revolving cylinders, one carrying the type form and the other the paper.

Platen presses are used chiefly for small printing, such as cards, forms, etc. Books and magazines are printed mainly on cylinder presses. Most newspapers are printed on rotary presses. These printing presses vary in size from small platen machines operated by hand to enormous newspaper presses having more than 50,000 separate parts and consuming paper at the rate of 75 miles an hour.

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Pressroom workers comprise something less than one-third of the people engaged in the printing industry. Their wages are somewhat lower than those of workers in the composing-room. They are highly unionized, have regular work, and receive somewhat better wages than skilled workers of corresponding grades in the metal trades. There is little formal apprenticeship and no fixed line of promotion. Beginners must pick up the trade through experience and practice.

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CHAPTER IV

THE BINDERY

Due partly to the fact that there is little book printing in Cleveland, the working force in this department of the industry is smaller than in the composing-room and pressroom departments. A considerable number of job-printing establishments send out their binding to firms which specialize on such work. There is a growing tendency towards this sort of specialization.

The bindery is the only department of the industry in which any considerable number of women are employed. Some of the occupations, such as gathering, sewing, and stitching, are practically monopolized by women. They are also employed extensively in hand- and machine-folding.

Occupations of Women Employees

Folding, the first operation in bindery work, may be performed either by hand or with machines. As a rule small sheets are folded by

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hand. The worker doubles the paper in such a manner that the printing on one page is exactly even with the printing on the other and creases the fold with a small bone stick called a folder. The operation is very simple and can be learned in a short time, although considerable practice is needed to do the work rapidly and accurately. Large sheets are usually folded by machines. The work of the operator is similar to pressfeeding. The machine automatically folds the sheets into the desired form, and slips them one by one into a neat pile on a receiver. When folded, the sheet is called a section. Where several sections are to go together in a book or pamphlet a small figure or letter, called a "signature," is printed on the first page of each section to serve as a guide in gathering.

In making up a book the gatherer moves rapidly along a row of folded sections, piled on a table in regular order, gathering one section after another until the book is complete. In one Cleveland bindery the sections are piled on a circular shelf arranged to revolve about the worker, who gathers one section after another as the shelf turns.

The sections are fastened together by hand or machine sewers. The book-sewing machines that are used in edition bookbinding do the work of eight or 10 girls. One girl feeds the sec-

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A Cleveland bindery. Hand-folding and gathering are for the most part done by women

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tions to the machines while another, usually a learner, cuts the threads between the completed volumes. Wire-stitching machines are used extensively on pamphlet work. The operation of both book- and wire-stitching machines is relatively simple, and most girls can learn the work well enough to earn average wages within a few weeks.

Besides the occupations of folding, gathering, and sewing, girls are employed in the bindery on many other kinds of work, such as numbering the pages of blank books, perforating pages of trading stamps and checks, punching holes in loose-leaf sheets, rounding off corners of pages, cutting pages for indexing pamphlets, and feeding ruling machines. In all except the largest binderies, the girls' work varies considerably from day to day according to the nature of the printing done in the shops.

Occupations in Which Men Predominate

From the standpoint of numbers employed, forwarding is the most important of the bindery trades. No women were engaged in this work in the establishments visited by the Survey Staff. The forwarder pastes on the first and last pages inside the book cover, trims the edges of the book with a cutting machine, rounds the

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back, and finally pastes on the cover. While not highly skilled work, forwarding requires accuracy, deftness of hand, and considerable experience in the different operations. It ranks as a skilled trade, requiring several years to learn.

One or two men are employed in every bindery to operate cutting machines used for cutting paper and trimming the edges of pamphlets and books. The work is similar to that of the pressroom cutter, already described. Only men are employed on this work.

Rulers operate machines for ruling blankbooks and business forms. The sheet is fed on a cloth belt which passes under a row of needles charged with ink. The machines are operated by men, although women feeders are frequently employed. Ruling is classed as a skilled trade. Several years' experience are required to obtain a thorough understanding of the work.

The finishing operations in bookbinding call for a high degree of skill. These operations include tooling, or the impression of border or corner decorations on book covers; stamping in the letters of the title on back or front; and the final cleaning of the covers. Not over 40 men in the city are engaged in this trade.

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Number Employed

Bindery occupations give employment to between 800 and 900 people, of whom approximately 46 per cent are men and 54 per cent women. Among the men the forwarders constitute more than one-fourth of the total number employed. The two other skilled trades—ruling and finishing—each employ about 35 men in the entire city. About one-fifth of the women are gatherers and one-fifth sewers and stitchers. The other three-fifths are distributed among a number of occupations usually classed as general bindery work.

Wages and Working Conditions

In the establishments from which wage data were collected by the Survey Staff, there were employed 284 bindery workers. The average daily earnings in the various occupations, based on returns from 44 establishments, were as shown in Table 6. They are believed to be fairly representative of the usual wages paid during the year 1915 for the different kinds of work specified.

Considerable time is lost through unemployment due to the seasonal character of the work The "rush" season usually lasts from September to December. Due in part to the fact that the in-

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dustry must depend mainly on the local market, the amount of work, and consequently the number of workers required, varies considerably from month to month. A few establishments engaged in a special line, such as trading stamp or bank check printing, keep a full force the year round, but this is often impossible in book and job establishments doing a general business. There is more irregularity of employment among the women than among the men.

TABLE 6.—AVERAGE DAILY EARNINGS OF BINDERY WORKERS IN CLEVELAND, 1915

Workers in trade	Men	Women
Foremen	$4.78	$2.05
Rulers	3.56	..
Finishers	3.51	..
Forwarders	3.23	..
Cutters	3.21	..
Machine-folders	2.81	1.49
Wire-stitchers	..	1.57
Apprentices	1.53	..
Gatherers	..	1.52
Sewers	..	1.52
Other bindery operatives	1.40	1.51

Health conditions compare favorably with those in other factory occupations. The work, although monotonous, is not usually exhausting. Conditions as to ventilation and sanitation in the plants visited were good.

In the occupations in which the majority of the women are employed, the beginner starts on such work as folding or pasting and, as op-

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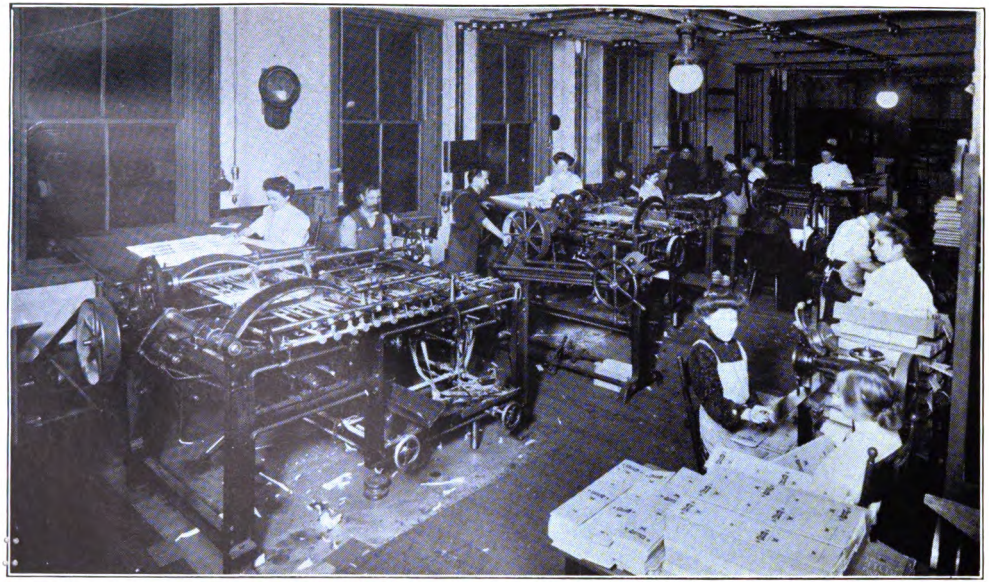

Folding and stitching machines in a bindery. Women do the feeding

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portunity presents, gradually acquires practice in the better paid kinds of work, such as gathering and machine operating. There are some traces of the apprenticeship system in forwarding, ruling, and finishing, but these trades are so small that all of them combined require only a very few new workers each year.

Summary

Less than 1,000 people are engaged in bindery work in Cleveland. Slightly more than half of them are women, most of whom are employed in work requiring only a fair degree of skill. There is considerable unemployment due to the seasonal character of the work, which employs more people during the winter months than during the summer. There is little apprenticeship, most of the workers gaining promotions gradually with increased experience rather than following any definite line of progress or training.

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CHAPTER V

PLATE-MAKING AND LITHOGRAPHY

Illustrations were first printed from wood cuts in the early part of the 15th century. A block of close-grained wood was engraved by hand in such a manner as to cut away from the surface everything except the lines and points that were to be reproduced in the finished illustration. These the engraver left standing out in relief. The surface was then coated with ink and a piece of paper pressed firmly against it. By this method the illustrations were printed one by one. Not many years after the development of this process, similar methods were used for making engravings on copper or steel plates instead of on wood blocks. Wood engravings are seldom employed in modern printing, and the use of copper and steel engravings is limited almost entirely to the printing of visiting cards, invitations, and announcements. Nearly all printing plates for the reproduction of pictures are now made by the photo-engraving process.

PHOTO-ENGRAVING

If the picture to be reproduced is a pen and ink drawing, or any sort of a drawing containing

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At work in the photo-engraving department

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only black lines or dots, it is first photographed directly on a glass plate. If the picture is a photograph, a glass screen, covered with two sets of fine black lines crossing each other at right angles, is inserted between the lens of the camera and the photographic plate, for the purpose of breaking up the solid tones of the photograph into tiny black dots. After development, the film is stripped from the plate, reversed, placed on another glass plate, and printed on sensitized zinc or copper. This plate is inked and afterwards washed, the ink adhering only to the printed parts which represent the lines or dots in the picture. The plate is next covered with an acid-proof powder or solution, and after heating is put into an acid bath which etches away the unprotected parts of the plate so that the lines or dots stand out in relief. When the etching is finished the surplus metal is cut away with a routing tool and the plate tacked on a wooden base to bring it up to the standard height of printing type.

Artists prepare the photographs or other original material for reproduction by retouching and shading with hand and air-brushes. Photographers operate the camera and develop the plate. The stripper strips the thin film from the photographic negative and transfers it to another glass. The etcher handles the plate in

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the etching process. The router cuts away such parts of the plate as are not to appear in printing. Blockers fasten the plates on wooden blocks. Finishers level up the engraving and cut away by hand such portions as the router cannot reach with his machine. Proofers make proofs of the finished engravings.

These classifications are adhered to only in the larger shops. In small establishments one man may perform several or all of the operations. The fact that all the photo-engraving shops in the city employ not over 100 men, working in from 20 to 30 shops, indicates the impossibility of maintaining sharply defined subdivisions. For this reason the boy who wants to become a photo-engraver should learn every branch of the trade. All the work, with the exception of blocking, requires considerable technical knowledge and skill.

TABLE 7.—AVERAGE DAILY EARNINGS IN PHOTO-ENGRAVING OCCUPATIONS, CLEVELAND, 1915

Workers in trade	Average daily earnings
Foremen	$6.72
Artists	6.32
Photographers	4.69
Etchers	4.52
Routers	4.25
Finishers	4.21
Proofers	3.69
Strippers	3.61
Blockers	2.36
Apprentices	1.49
Art apprentices	1.27

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The trade is strongly unionized and maintains an apprenticeship system for beginners. The period of service is from four to five years. Average daily earnings in the different occupations are shown in Table 7.

Stereotyping

Stereotyping as used in the printing of newspapers is a method of duplicating in a single sheet of metal the form of all the type that would otherwise be needed to print an entire page. The reading material of the page is first set up in type by hand or by means of the linotype machine. This constitutes the type form. A sheet of paper pulp (papier-mache) is then laid on the face of this form and pressed against the type by a powerful roller. This process makes the paper pulp into a sheet known as a matrix, having on its surface an exact reproduction of the letters, rules, and illustrations of the type form. This matrix is next placed in a curved mold and hot stereotype metal, which is similar to ordinary type metal, is poured in. By this means stereotype plates are produced which are curved so as to fit the cylinders of the rotary presses and which have on their faces exact duplications of the original type forms. The purpose of this stereotype process is to

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produce a printing form that is solid and at the same time curved to fit the cylinders of the rotary press. These objects cannot be attained by the use of the ordinary movable type used in hand setting.

There is little stereotyping done in Cleveland outside of newspaper establishments. The total number of stereotypers in the city does not exceed 40 or 50, including foremen, journeymen, and apprentices. The average daily wage is about $4.00.

Electrotyping

Many illustrations, particularly those used in advertisements, are printed from electrotype plates. By this process any number of plates can be made from a single original. Type pages are frequently electroplated when large editions of books are to be printed, so as to save wear on the type and permit of its immediate use in other work.

The electrotyper first takes an impression in wax of the type form or engraving which is to be reproduced. The projections and sharp edges are then cut off and the low spots built up with melted wax, after which the mold is coated with graphite and placed in a tank containing a bar of copper and an acid solution. A current of electricity passing through this bath dissolves

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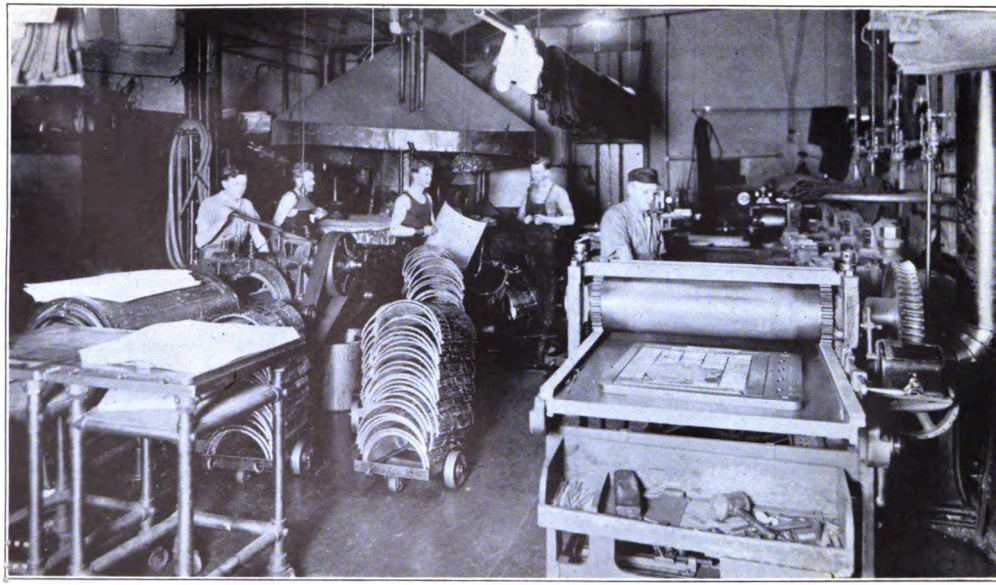

Stereotyping. Curved forms of pages are made in a few minutes

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the copper and deposits it in a thin layer on the face of the mold. The mold is then taken from the tank and the thin copper plate stripped from its face and stiffened by baking it with about a quarter of an inch of lead. The routing, finishing, and blocking are performed in the same way as in the photo-engraving process.

The classification of occupations includes case fillers, molders, builders, batterymen, casters, routers, finishers, and blockers. The total number of men in the city employed in these various occupations does not exceed 115. On the whole, the work is less highly skilled than photo-engraving. The trade is strongly unionized. There is no real apprenticeship system; beginners are employed in the less skilled occupations, such as blocking, and learn the trade by practice and observation. Average daily earnings in the different occupations are shown in Table 8.

TABLE 8.—AVERAGE DAILY EARNINGS IN ELECTROTYPING OCCUPATIONS, CLEVELAND, 1915

Workers in trade	Average daily earnings
Foremen	$4.91
Molders	4.41
Finishers	4.01
Casters	3.18
Routers	3.17
Builders	3.13
Blockers	2.05
Batterymen	1.97
Case fillers	1.59
Apprentices	1.10

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Most fine color work in printing, such as magazine covers and circus and motion picture posters, is done by the lithographic process. It differs radically from type or plate printing in that the printing surface is flat, while in type and plate work it is in relief.

The design is usually drawn upon a stone of special composition. After the stone has been carefully planed and polished, the design is put on with greasy crayon or greasy ink. The rest of the stone is then washed with an acid which gives it additional absorbing power. The press is provided with water rollers which saturate the parts of the stone not covered by the design. The water-soaked portion repels the ink, while the portion covered by the design absorbs the ink from the ink rollers and transfers it to the paper.

In poster work the design is usually drawn by an artist directly upon the stone; in other work, such as printing bank checks, the sketch is first made on a special kind of paper and then transferred to the stone by pressure. When several colors are used, a separate stone must be made for each color. Zinc plates are sometimes used in this process.

Two of the largest lithographic plants in the country are located in Cleveland and probably

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two-thirds of all the lithographic work of the country is done here. About 400 men are employed, of whom about 65 per cent are engaged in preparing the stones for printing, and about 35 per cent in the pressrooms. Only three of the skilled occupations—those of the poster artists, pressmen, and transferrers—employ more than 20 men each. Poster artists, who draw directly on the stone the designs for circus and moving picture posters, constitute the largest group. Their work gives opportunity for the exercise of considerable artistic ability and taste. From the wage standpoint it ranks first among the skilled industrial occupations in the city. It must be said, however, that partly because of the small number employed—between 140 and 160 in all—and partly because of the stringent union regulations as to apprentices, the opportunities for learning the work are limited. It has the further disadvantage of being highly localized, as poster printing is done in only a few cities of the country.

The work of the lithographic pressman differs considerably from that of the pressman in most book and job establishments. On the mechanical side the requirements are about the same, but the use of both water and ink rollers, and a flat printing surface, makes for a consider-

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able difference in methods of operation. The organization of the pressroom is similar to that in book and job establishments.

The average daily earnings of lithographic workers in the establishments from which wage data were collected during the Survey are shown in Table 9.

TABLE 9.—AVERAGE DAILY EARNINGS IN LITHOGRAPHIC PRINTING OCCUPATIONS, CLEVELAND, 1915

Workers in trade	Average daily earnings
Lettermen	$6.63
Artists	6.41
Pressroom foremen	5.80
Grainers	4.73
Engravers	4.35
Pressmen	3.91
Transferrers and proofers	3.41
Pressroom apprentices	2.80
Tracers	2.63
Stone polishers	2.53
Pressfeeders	1.72
Other apprentices	1.59
Artist apprentices	1.23
Flyboys	1.10

As in other departments of the industry, the workers are strongly organized. The unions exercise close control over the admittance of new workers. The poster artists' union takes an unusual amount of interest in the selection and training of apprentices, and endeavors to provide every opportunity for them to learn every phase of the work during their term of service. In the pressrooms there is no system of or-

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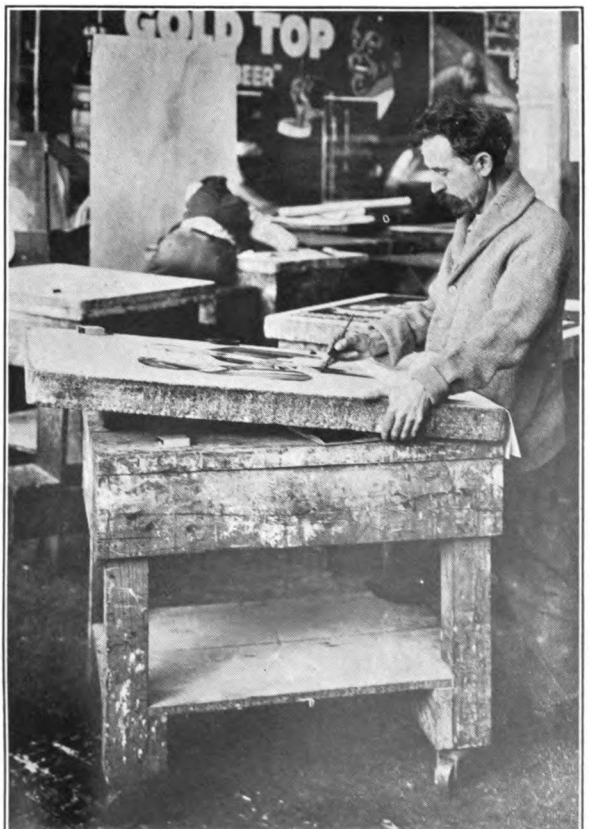

Sixty-two per cent of all lithographic poster work of the country is done in Cleveland

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ganized training for apprentices. Beginners start as flyboys or pressfeeders, and work up gradually to the positions of floormen and pressmen.

Summary

The workers in photo-engraving, stereotyping, electrotyping, and lithography number perhaps 700 in Cleveland. They are distributed among more than 20 distinct trades requiring the most diverse sorts of skill, knowledge, and training.

There are about 100 men in the city engaged in the different processes of photo-engraving, and they are scattered among as many as 25 different establishments. There are from 60 to 70 men engaged in stereotyping, most of whom are employed in the newspaper offices. There are about 125 electrotypers, and these workers, like the engravers and stereotypers, are strongly unionized. In all three branches of the work the employees are mostly men; they are divided among a large number of trades; they earn fairly good wages; they suffer little from irregularity of employment; and they are employed in very small groups in a large number of different establishments.

Most of the lithographic poster work of America is done in Cleveland. There are about 400 men engaged here. The work is highly

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skilled, well paid, and strongly unionized. The lithographic poster artists are numerous and are the highest paid workmen in industry in this city.

There is no well-organized system for training apprentices among the photo-engravers, stereotypers, or electrotypers, but there is an efficient and strictly regulated one for beginners among the poster artists.

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CHAPTER VI

TRAINING BEFORE THE BOY LEAVES SCHOOL

In the preceding pages we have indicated some of the educational qualifications essential to success in the several trades of the printing industry. They vary widely. There is little relation between the technique of hand-composition and the technique of presswork. The kind of instruction that would most directly benefit the pressman would be of small value to the bookbinder or the photo-engraver. There are few trade elements common to these different occupations. This condition has an important bearing on the problem of vocational training which will meet the needs of more than a single trade.

The Elementary School

Up to the end of the compulsory attendance period, school training, preparatory to entering the printing trades, must be of the most general sort. There are two reasons for this. The first

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is that only a few boys in the elementary schools are sure that they desire to enter the printing industry, and among these there are few indeed who have sufficient knowledge of industrial conditions to know which one of the 50 trades they desire to go into.

The second and most important barrier that stands in the way of the establishment in elementary schools of trade preparatory courses for printing is that there are not enough boys in any one school to warrant the establishment of such special courses in that building.

Most of the boys in our public schools were born in this country. In a few years they will be grown up. When they grow up they will be scattered through the different trades, professions, and industries in about the same proportions as are the American-born men of the population at the present time.

One of the important facts repeatedly impressed upon the student of occupational statistics is that the figures showing the occupations of the people in different localities show wonderfully constant relationships from year to year. Individuals change frequently from one occupation to another. But in any given community the proportions of people engaged in each branch of work change but slowly from decade to decade. This is true even of occupa-

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tions that we think of as having been revolutionized within the past few years. For example, 10.3 per cent of the women workers of Cleveland were employed in offices in 1900 and 10 years later the proportion had only increased to 14.1 per cent. Even slower changes are the rule in other industries and occupations, except when some great change, such as the development of the automobile, produces a new group of workers or reduces an old one.

Thus we may be almost certain that when the boys now in the public schools of Cleveland reach adult manhood they will go into the different occupations in about the same proportions in which their fathers and older brothers are now distributed among them. This means that among each 20 boys there are about eight who will go into mechanical work, eight more who will enter the commercial and clerical fields, two who will go into transportation, one who will be engaged in domestic or personal service, and one who will be in some professional or public position. It is interesting to note that nearly half of these boys will be engaged in head work rather than hand work.

Let us now consider how this principle affects the problem of establishing school courses which will prepare boys to enter the largest trade in the printing industry—hand and machine com-

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position. How many boys now in the public schools are likely to be compositors when they grow up? According to the census of 1910 there were in Cleveland in that year 739 compositors, type-setters, and linotypers between 20 and 45 years old, of whom approximately 600 were of native birth. The total number of native-born men in the city between these ages was about 65,000, of which the compositors constituted slightly less than one per cent.

Applying this ratio to the school administrative unit we obtain surprising and rather discouraging results. In an elementary school of 1,000 pupils there would be, including all ages and grades, approximately 500 boys, of whom about one per cent, or five boys, may be expected to become compositors. But many of the boys are below the age when vocational training of any kind is advisable. It is the commonly accepted view among educators that such training should not be undertaken before the age of 12 years, and many believe that this is too early. The number of boys 12 years old and over in a school of 1,000 pupils does not usually exceed 160. Applying the ratio to this number we find that our class of prospective compositors dwindles to about two boys. Even if we add all the workers in the other printing trades and in the semi-skilled and unskilled

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The composing-room of a large Cleveland newspaper plant

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occupations of the industry, the case is not much better. The total number of male wage-earners, both foreign and native, employed in the industry at the time of the last census was about 2,700, or less than four times the total number of compositors, so that a general course for all the boys who are likely to become printers of any kind would directly benefit about six boys. A class of this size is too small to justify the employment of special teachers and the purchase of special equipment.

Bookbinding, introduced in the manual training course here this year, offers another excellent illustration of the difficulties which attend vocational training for small trades. There are approximately one-fifth as many bookbinders as there are compositors in the city; consequently of any given number of boys in the public schools, about one-fifth of one per cent may become bookbinders. The number enrolled in the larger of the two schools in which this course is now taught is about 400. In a group of this size there would be, at the most, one future bookbinder.

The Junior High School

The junior high school plan, tentatively adopted by the school system this year, has the ad-

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vantage, for the purposes of vocational training, of concentrating in relatively large groups boys old enough to begin such work. Yet even here the small number of boys who can be expected to enter the printing industry constitutes a nearly insuperable obstacle to the establishment of a specialized course. In the Empire School, the larger of the two junior high schools now established, there are enrolled approximately 400 boys. Of these, not more than three or four are likely to become compositors, and the total number who will enter the printing industry in any capacity does not exceed eight or nine.

At present the junior high schools take only seventh and eighth grade pupils. If a ninth grade is added, the enrollment of boys in the Empire School will probably increase to 500. A rough classification of their future occupational distribution works out as follows:

Boys who will enter

Manufacturing and mechanical occupations	220
Commercial occupations	100
Clerical occupations	80
Transportation occupations	55
Domestic and personal service occupations	25
Professional occupations	15
Public service occupations	5
Total	500

It will be noticed that the boys who are headed for professional, clerical, or commercial work

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form a group nearly equal in size to the body of future industrial workers. A further analysis of the industrial group will show approximately the number likely to enter skilled trades.

Boys who will enter

Metal trades	50
Building trades	45
Printing trades	9
Other trades	12
Semi-skilled and unskilled industrial occupations	104
Total	220

If there were enough common elements among the various metal and building trades, the number who will later enter them might justify a general metal trades' course or a building trades' course. A special printing course for nine boys is, however, administratively impossible. While it is probable that among boys who go as far as the junior high school the proportion entering the skilled trades will be somewhat larger than these figures show, and the proportion of unskilled and semi-skilled somewhat smaller, nevertheless the figures are fairly reliable and better than any others that are available.

A General Industrial Course

It is the opinion of the Survey Staff that a general industrial course should be provided for

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the boys who are likely to enter industrial work when they leave school, and who comprise nearly one-half of the enrollment. Specific trade training should not be attempted during the junior high school period. What the boys need at this time is practice in the application of mathematics, drawing, and elementary science to industrial problems, and the shop equipment should be selected with this object in mind. It is doubtful whether it should include a print shop, for while such a shop would be useful to the boys who will become printers, it would be of little value in training for other industries. The future carpenter or machinist will benefit very slightly, if at all, from learning to set type. Moreover, printing equipment occupies an amount of space out of all proportion to its general utility in the ordinary public school.

In the volume of the Survey report dealing with the course of study, printing has been suggested as a desirable branch of manual training for the purpose of making the boys familiar in a concrete way with materials and processes in their details, with the nature of work, and with the nature of responsibility. It is quite true that printing is one of the available forms of manual training work having distinct value for the purposes suggested. In the present chapter, however, it is being con-

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sidered from the point of view of trade-preparatory training, and here its limitations are serious.

The printing trades have certain educational needs in common with the larger building and mechanical trades which can be met in a general industrial course. The pressman, the linotyper, and the monotyper are machine operators, rather than hand craftsmen. They need the same general familiarity with mechanical movements and the physical laws underlying them that machinists, pattern-makers, molders, steam engineers, and other mechanical tradesmen need. Much of this kind of knowledge can be secured through practice in taking apart and assembling various types of machines. Such work offers more opportunity for obtaining an understanding of mechanical principles than machine operating, although this also should have its place in the course. Almost every boy is intensely interested in getting at the "insides" of a machine, and a series of problems in machine assembling will not only provide greater facilities for teaching the theory of mechanics, which is what the boys most need, but will hold the interest of the class better than machine operating or tool work alone.

A knowledge of the principles of color harmony is of great value to lithographers, press-

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men, and hand-compositors. It is also needed by painters and paperhangers who form one of the largest trade groups in the city. Instruction in this subject should be included in the general industrial course, or made available in connection with the work in drawing.

A knowledge of the principles of design is also of considerable advantage to lithographers and compositors. There is a constantly growing demand for printing which conforms to æsthetic as well as typographical standards. The first-class compositor should be something of an artist. He ought to know how to make a free-hand sketch of any job submitted to him, so that before the type is set he can be sure that the arrangement of the material and the selection of type will give the most pleasing effect. Familiarity with artistic standards is even more essential in some of the lithographic trades. The ability to do free-hand lettering rapidly and fairly well is an asset in many other industrial occupations. Both lettering and design should be given a prominent place in the drawing course.

All work in the composing-room, the largest department of the industry, demands a thorough knowledge of spelling, punctuation, and the division of words. These elements of language are of indirect vocational value in practically

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every trade. The carpenter, or machinist, or painter, or electrician can get along without them, but if he hopes to advance beyond routine work, the ability to spell and punctuate correctly and express himself grammatically becomes of real vocational utility. It is not suggested that instruction in English for boys who expect to enter industrial occupations should be differentiated from that provided for other pupils in the school. It is not, however, asking too much that every boy at the end of the compulsory period be able to spell, punctuate, and write simple English correctly. If he is going to work at 15 or 16, these utilitarian elements of language will be of the greatest value to him.

The necessity for keeping the utilitarian viewpoint constantly in mind is emphasized by the fact that the ages of 14 and 15 represent the school's last chance at the boys who will later become artisans, and that many of these boys are from one to three years behind their grades. Educationally, printing workers rank higher than those in other factory occupations, yet even in this industry the average journeyman possesses less than a complete elementary education. Composing-room employees are the best educated men in the industry, yet the investigations conducted by the Survey show that only 28 per cent had received any high school

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training, and only eight per cent were high school graduates. Six per cent had left school before entering the seventh grade, and 16 per cent before entering the eighth grade. In other departments of the industry the showing was even less favorable.

Another type of instruction that is of great importance in these last years of the boy's school life relates to economic and working conditions in wage-earning occupations. There can be no such thing as an intelligent choice of vocation without accurate and comprehensive information as to such matters as wages, unemployment, hours of labor, health conditions and accident risks, chances for advancement, and opportunities for employment in each trade. Information of this sort is available in state and federal labor reports, and can be obtained locally through labor unions and employers' associations. The present series of industrial education studies contains a great deal of valuable material for a course of this kind.

A Two-year Vocational Course Needed

The school records show that about one-half of the boys enrolled in the public schools drop out at the ages of 14 and 15. About one-fourth of these boys have less than a seventh grade

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education when they leave school and one-half have not completed the elementary course. Less than one-fourth have had any high school training. Besides the handicap of a scant educational equipment, they find when they seek employment that industry has no jobs that lead anywhere for 14 and 15 year old boys. Very few of the skilled trades in Cleveland will take an apprentice under the age of 16. In the printing industry the compositors' union, which represents a large proportion of skilled printing workers, fixes the entering age at 16, and several other printing unions maintain the same rule. As a result of this condition a large number of boys spend a year or two drifting about in transient jobs which not only offer no chance for advancement, but which often prove to be the first steps toward an aimless odd-job working life.

At present the school permits the boy to go to work before the world of industry has any real use for him. The investigations conducted during the Survey have convinced the members of the Survey Staff that the present age limit for compulsory attendance is about one year below the requirements of industry. The limit should be increased to 16, and provision made for a more direct preparation between 14 and 16 for entrance into wage-earning occupations than is offered by the present school facilities.

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This might be done either through a modification of the technical high school course for the first two years or by the establishment of a two-year course in a separate vocational school. The course in the larger of the two technical high schools, the East Technical, includes shop work in joinery and wood-turning during the first year, and in pattern making and foundry work during the second year. In the West Technical High School all boys take pattern making and forging, or sheet metal work during the first year, and forging, pipe-fitting, brazing, rivetting, and cabinet work during the second. Printing is introduced as an elective subject in the third and fourth years. The proportion of technical high school graduates who become printers, however, is so small as to be practically negligible. An investigation as to the occupations in which graduates of the East Technical High School were engaged in 1915, showed less than one per cent employed in the printing industry. Boys who are going to become journeymen artisans do not as a rule enter the high schools, or if forced in by the law during the last year of the compulsory attendance period, stay but one year.

The fact that both technical schools are crowded at the present time and the difficulties that are inevitable in the administration of

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simultaneous two-year courses and four-year courses in the same school, weigh heavily against the chances of finding a solution of this problem in the technical high schools. The present courses were formulated to meet the requirements of boys who expect to go on to college, rather than those of boys who will go to work in the trades. Yet 25 per cent of each entering class drops out after attending one year, and 25 per cent of the remainder at the end of the second year. A separate school in which greater emphasis could be placed upon direct training for the industrial trades, would result in a more profitable use of the pupils' time and would probably induce many of them to remain in school up to the apprentice entering age.

Such a school, with a curriculum embracing vocational training for all the principal trades, should be able to command an enrollment of sufficient size to warrant a first-class shop equipment and a corps of well-trained shop teachers. The number of boys from the public schools who enter the skilled trades each year indicates that pupils for a two-year course would not be lacking. Even if only one-half of them attended the school, the enrollment would reach at least 800 boys. In a school of this size the number desiring to learn any one of the important trades would be sufficiently large to

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make possible economical, practical instruction. Such printing trades as composition and press-work would be represented by classes of from 30 to 40 boys each.

A full description and discussion of the details of organization in a school of this type is contained in the report of the Survey entitled, "Wage Earning and Education." We may suggest in this study, however, the outlines of a course which it is believed would give valuable preparatory training for boys who expect to go to work in the printing industry. For the first year the course should aim to give the pupils a general familiarity with printing processes. The boy should be encouraged to make a definite choice as early as possible among the several trades, and then devote his shop time exclusively to the trade selected. It is not expected that within the time available more than a beginning could be made in any of the trades. It is not the object of such a school to produce skilled workmen, but to turn out boys who can start as apprentices with a general knowledge of trade theory. The boys will have plenty of opportunities during the apprenticeship period to acquire speed and manual skill, but very few for securing a clear understanding of the relation of drawing, physics, chemistry, mathematics, and art to their work. They learn the

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how, but not the *why*, of the trade. It is in teaching the *why* that the vocational school can perform its most valuable service.

Besides the usual supply of type, type cases, composing tables, and other composing-room equipment, the shop should be provided with several platen presses, and at least one cylinder press. Shop teachers must have a thorough understanding of trade theory, and experience as journeymen in job-printing establishments.

As far as possible all the shop work should be kept in close touch with the academic studies. The minimum standard for completing the course in English should be a thorough knowledge of the rules of punctuation, capitalization, and grammar, gained through work of the most practical kind. To the printer, language is a tool, in the use of which he needs a definite kind of skill, and the aim in teaching this subject should therefore be the development of ability to use English for a specific purpose.

In mathematics the printer needs little beyond a thorough knowledge of arithmetic. Many journeymen are lacking in the ability to apply arithmetical principles quickly and accurately to problems involving type measurements and the laying out of printing jobs. The amount of waste, both of time and material, due to rule-of-thumb methods, accounts to a considerable

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extent for the high percentage of failures in printing shops.

Because of the small initial investment, this industry affords many opportunities for the ambitious workman to establish a business of his own. That so few succeed is due chiefly to their ignorance of business methods and their failure to apply the principles of exact accounting to their expenditures of time, materials, and money. They guess rather than estimate the cost of paper and the time required to set and print a job; they waste paper and time by guessing at sizes; and in estimating costs fail to reckon the time lost in making corrections. Almost invariably they cut prices, and at the end of a year or two they cannot understand why their balance is on the wrong side of the books. Every first-class shop maintains an accurate system of cost accounting. The journeyman workman should know not only how to fill out his time-sheet, but what it means in the general economy of the shop. For this reason the mathematics course should include a large number of problems stated in terms of printing costs, and a rigid system of cost accounting should be followed in all the shop work.

Elementary science should form an important part of the proposed course. A general

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knowledge of the principles of mechanics, the chemistry of inks, color harmony, electricity, and the composition of paper is needed by every printer. The teaching of both chemistry and physics should closely follow trade lines. The same rule should be observed in drawing. Free-hand lettering, applied design, and practice in sketching "layouts" should be given special attention.

The history and economics of the industry should be taken up in the second year. The future printer should possess an understanding of the development of printing during the past century, and the part that modern invention has played in this development. He should also be made familiar with the general organization of the industry, the advantages and disadvantages of each trade, union regulations, the nature of occupational diseases and how to guard against them, etc. The course should acquaint him with the literature of the various trades, such as handbooks, trade and labor organization journals, and special publications relating to the industry. The vocational school merely introduces him to the trade. His learning period lasts for several years after he leaves the school, and the course should put him in intelligent contact with the sources of knowledge that will be useful to him in the future.

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Summary

There are two important barriers standing in the way of establishing in elementary schools trade-preparatory courses in printing. The first is that few of the boys in these schools are sure that they want to enter the printing industry, and if they were sure there are few indeed among them who know which of the 50 trades of printing work they desire to go into.

The second barrier is the fact that only three boys in each 100 among those in school in Cleveland will probably enter the printing industry. This means that there are not enough of them in any one elementary school to render the establishment of special, trade-preparatory classes practicable.

In junior high schools, where boys of the upper ages are brought together in large numbers, the establishment of general industrial courses is recommended, and in these the future printers should be given instruction in mechanics, drawing, design, color harmony, and elementary science.

The establishment of a two-year vocational course is recommended with first-class shop equipment and well-trained teachers for classes in printing.

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CHAPTER VII

TRAINING FOR APPRENTICES AND JOURNEYMEN

Both of the technical high schools offer evening courses in printing. The night school year comprises 80 hours of instruction, given in two terms of 10 weeks each. The schools charge a tuition fee of $5.00 a term, of which $3.50 is refunded if the pupil maintains an average attendance of 75 per cent. In a few instances employers meet this tuition expense for their apprentices.

Of the 28 persons enrolled in the printing course in the East Technical Night School during the spring term of 1915–16, three were journeymen printers, five described themselves as "helpers," 11 were apprentices, one was employed in the office of a printing establishment, and eight were engaged in occupations unrelated to printing. No special provision is made for apprentices. The course consists of hand-composition, a little presswork, and lectures on trade subjects. The class in the West Technical Night School was suspended at the end of the first term this year.

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An idea of how small a factor the school represents in the training of printing trades' apprentices may be gained by comparing the present enrollment of 11 apprentices with the total number in the city, estimated at from 200 to 250. The course is planned "to help broaden the shop training of those working at the trade." That it does so to any considerable extent is doubtful. Most of the boys who attend are employed during the day in composing-rooms, where they get a maximum of practice and a minimum of theory. Whether an additional two hours of hand-work at night two nights a week for 20 weeks is productive of much benefit is open to serious question. The true function of the night school should be to supply trade instruction which the apprentice has no opportunity to secure in the shop, rather than additional practice in the kind of work which his job already provides in abundant measure.

It is instructive to compare the methods followed in the night schools with the practice in the apprentice course prescribed by the International Typographical Union. This course, established a few years ago, is required during the fourth and fifth years of the apprenticeship period. It is taught by journeymen in evening classes, under the supervision

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of the central office of the Typographical Union Commission on Trade Education, located in Chicago, to which all the work must be submitted. For this purpose the local union, which pays the cost of instruction, has appropriated the sum of $3,000 for the current year. In February, 1916, about 100 students were enrolled, of whom approximately one-third were apprentices, and two-thirds journeymen.

The course is undoubtedly the best yet devised for giving supplementary training to compositors. It consists of 46 lessons in English, lettering, design, color harmony, job composition, and imposition for machine and hand-folding. The particular subjects covered in the series are as follows:

English, Punctuation, Capitalization
Punctuation (3 lessons)
Use of capital letters
Proof-readers' marks and their meaning
Type-faces and their use
The question of spacing
The use of decoration in typography
The question of display

Free-hand lettering
Roman capitals in pencil
Roman lower-case in pencil
Italics in pencil
Inking in Roman capitals

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Inking in Roman lower-case
Inking in Italic
Gothic alphabets
Making title page design
Making cover page design

Principles of design

Balancing measures
Proportion
Shape harmony
Tone harmony
Preliminary sketches, or arrangement of lines and masses

Principles of color harmony

Color harmony (5 lessons)

Every-day job composition

Composition of letter-heads, bill-heads, business cards, envelope corner-cards, tickets, menus, programs, cover pages, title pages, and advertisements (10 lessons)
Hand-lettered advertisements
Lay-outs of booklets and books (on paper and plates)
Paper-making
Plate-making of various kinds

Imposition for machine and hand-folding

Four and eight page forms
Twelve and 16 page forms
Twenty-four and 32 page forms

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The work in English and free-hand lettering is optional. The classes are held at the headquarters of the union. The course is confined to trade theory, the idea being that the student's daily practice in the shop provides plenty of opportunity for the acquisition of manual skill, and for this reason no apparatus or shop equipment is deemed necessary in connection with the course.

Commendable as this work undoubtedly is, its shortcomings are apparent. It is at present available for none but compositors, and leaves altogether untouched the pressing problem of vocational training during the first three years of the apprenticeship term. The latter objection is a serious one. The formative years from 16 to 18 are among the most important in the boy's life. If left to his own devices during this period, he is very likely to lose much of the vocational value of his earlier education, because he does not grasp the relation which the knowledge he acquired in school bears to his daily work. As a result, the problem of instruction at a later age becomes much more difficult than if this supplementary training had been more closely connected with his regular school training.

From the standpoint of public education, vocational training for printing apprentices is

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but one phase of the problem of training apprentices in all industries. Furthermore, the whole body of apprentices in the skilled trades is no more deserving of consideration than the army of young workers in semi-skilled occupations where there is no system of apprenticeship. The present practice of losing track of 15- and 16-year-old boys and girls who leave school and go to work represents an inadequate and defective educational policy. The law requires boys to attend school until the age of 15, when they attain what appears to be considered their educational majority, although in every other sense they are still children. As a matter of fact they are at this age as immature educationally as they are physically.

The vocational interests of young workers and the social interests of the community are both opposed to the current practice of "graduating" boys from the public schools at this early age and then losing sight of them. The fact that the large number who go into industrial occupations will not or cannot remain in school beyond 15 or 16 does not absolve the school system from further responsibility for their educational welfare. There should not be a complete severance between the boy and the school, at least not until he has reached a relatively mature age. In other words, the school system should main-

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tain, as long as possible, such a relation with him as will help to round out his education and keep open before him the vistas of future progress.

The only practicable means for doing this lies in the compulsory continuation school. It avoids the difficulties which are responsible for the common failure of those schemes which depend for their success on the initiative of individuals or the voluntary coöperation of employers and trade unions. One very great advantage of the compulsory continuation school is that the principle on which it is based makes for equal justice to all. The decline of apprentice training in the shops is due largely to the fact that many employers have found that the expenditure of time and money involved largely goes towards providing a skilled labor force for competitors who make no effort to train young workers. The coöperation of employers on a comprehensive scale will be secured only when the burden is equally shared by all.

A compulsory continuation law, requiring school attendance a certain number of hours per week by all boys at work, up to the age of 18, would make possible practical vocational training for nearly all the apprentices in the city during the first two years of their term of service. There are enough compositors' apprentices alone to form a class of from 60 to 80

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boys. The total number of young workers of these ages in all branches of the industry probably exceeds 200—a group sufficiently large to permit of specialized training for all the more important trades.

Supplementary instruction for apprentices and for all young people at work is too big an undertaking to be conducted on the basis of single trades or single industries. Judging by past experience in this and other cities, the results that may be expected from the efforts of employers' associations, trade unions, private agencies, or night schools in which attendance is voluntary, are too small to constitute all together more than a fair beginning. A just and effective solution of this problem can be secured only through mandatory action that will reach every adolescent worker in every industry in the city.

Journeymen

The printing course now conducted in the technical night schools represents the only trade extension training for printers now given under public school auspices. Only three journeymen were enrolled during the second term of 1915–16. It must be admitted that the course offers little to men who have reached the grade of journeymen. Perhaps no better proof

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of this is needed than the pitifully small enrollment as compared with the total number of journeymen printers employed in the city—approximately 2,000.

About two-thirds of the students enrolled in the evening classes conducted by the Typographical Union are journeymen. The course is the same as for apprentices, but covers many points in trade theory with which the average workman is not acquainted.

Night trade extension courses for the larger printing trades, adapted to the needs of journeymen workers, would undoubtedly attract a considerable number of the men employed in the industry. What they want is English, applied design, the principles of art, and trade physics and chemistry. They need the theory of printing rather than practice in type-setting or in the operation of small presses. This fact must be recognized before the night schools can hope to obtain more than the present negligible results. Trade extension courses for journeymen printers are but one phase of the general problem of supplementary training for adult workers. When the school system is ready to undertake a comprehensive program of night school instruction, the printing trades will be among the first to respond.

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Summary

The technical high schools offer evening courses in printing in which there are enrolled three journeymen printers, 11 apprentices, and eight "helpers." The courses offered are so meager, the work so largely typesetting, and the number of students so small, that these evening classes contribute but little toward the training of the hundreds of apprentices and thousands of journeymen in the industry in this city.

Far more valuable and practical training is given in the evening courses maintained by the printers' union but these are mainly of value to compositors and are not open to beginners in the first three years of their apprenticeship.

The most urgently needed reform in training for workers in the printing industry is the educational bridging of the gap between the time when the boy gets his first job in a printing establishment at 15 or 16, and the time when he becomes a journeyman worker five years later. Especially during the first part of this period the school should furnish effective aid to the youthful citizen making the difficult transition from boyhood to manhood, from school-control to self-control, from home-support to self-support, and from learning in the school to doing in the shop. This aid should be

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given to all young workers as well as to those going into the printing industry.

To attain these ends it is recommended that the Cleveland school authorities give their support to bring about the enactment of a compulsory continuation school law requiring school attendance for a certain number of hours a week by all boys and girls up to the age of 18 who are at work. The training of these young workers is too important to be neglected. It cannot be comprehensively or satisfactorily done through volunteer effort. Neither can it be brought about by mere legal enactment. Courses of work, teachers, equipment, and, above all, able and enthusiastic leadership of a new sort and high quality will have to be provided. This will necessitate increased funds not now available. All of these requirements the city must meet if it is to develop a truly modern and adequate educational system.

As a supplement to the compulsory continuation courses, elective ones for adult workers should be established in the evening schools. These must be far more comprehensive and much better taught than the present ones if they are to be of large practical value.

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CLEVELAND EDUCATION SURVEY REPORTS

These reports can be secured from the Survey Committee of the Cleveland Foundation, Cleveland, Ohio. They will be sent postpaid for 25 cents per volume with the exception of "Measuring the Work of the Public Schools" by Judd, "The Cleveland School Survey" by Ayres, and "Wage Earning and Education" by Lutz. These three volumes will be sent for 50 cents each. All of these reports may be secured at the same rates from the Division of Education of the Russell Sage Foundation, New York City.

Child Accounting in the Public Schools—Ayres.
Educational Extension—Perry.
Education through Recreation—Johnson.
Financing the Public Schools—Clark.
Health Work in the Public Schools—Ayres.
Household Arts and School Lunches—Boughton.
Measuring the Work of the Public Schools—Judd.
Overcrowded Schools and the Platoon Plan—Hartwell.
School Buildings and Equipment—Ayres.
Schools and Classes for Exceptional Children—Mitchell.
School Organization and Administration—Ayres.
The Public Library and the Public Schools—Ayres and McKinnie.
The School and the Immigrant.
The Teaching Staff—Jessup.
What the Schools Teach and Might Teach—Bobbitt.
The Cleveland School Survey (Summary)—Ayres.

Boys and Girls in Commercial Work—Stevens.
Department Store Occupations—O'Leary.
Dressmaking and Millinery—Bryner.
Railroad and Street Transportation—Fleming.
The Building Trades—Shaw.
The Garment Trades—Bryner.
The Metal Trades—Lutz.
The Printing Trades—Shaw.
Wage Earning and Education (Summary)—Lutz.

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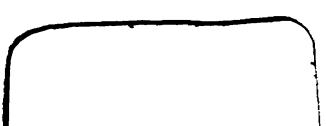

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